

20 Measuring GDP and Economic Growth

After studying this chapter, you will be able to

- Define GDP and use the circular flow model to explain why GDP equals aggregate expenditure and aggregate income
- Explain how Statistics Canada measures Canadian GDP and real GDP
- Describe how real GDP is used to measure economic growth and fluctuations and explain the limitations of real GDP as a measure of economic well-being

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Will the Canadian economy weaken through the next year and shrink, or will it remain strong and expand?

To assess the state of the economy and to make big decisions about business expansion, firms use forecasts of GDP.

What exactly is GDP?

How do we use GDP to tell us whether our economy is in a recession or how rapidly our economy is expanding?

How do we take the effects of inflation out of GDP to reveal the growth rate of our economic well-being?

And how do we compare economic well-being across countries?

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◆ Gross Domestic Product

GDP Defined

GDP or **gross domestic product** is the market value of all final goods and services produced in a country in a given time period.

This definition has four parts:

- Market value
- Final goods and services
- Produced within a country
- In a given time period

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Market Value

GDP is a market value—goods and services are valued at their market prices.

To add apples and oranges, computers and popcorn, we add the market values so we have a total value of output in dollars.

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Final Goods and Services

GDP is the value of the *final goods and services* produced.

A **final good** (or service) is an item bought by its final user during a specified time period.

A final good contrasts with an **intermediate good**, which is an item that is produced by one firm, bought by another firm, and used as a component of a final good or service.

Excluding intermediate goods and services avoids double counting.

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Produced Within a Country

GDP measures production within a country—domestic production.

In a Given Time Period

GDP measures production during a specific time period, normally a year or a quarter of a year.

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GDP and the Circular Flow of Expenditure and Income

GDP measures the value of production, which also equals total expenditure on final goods and total income.

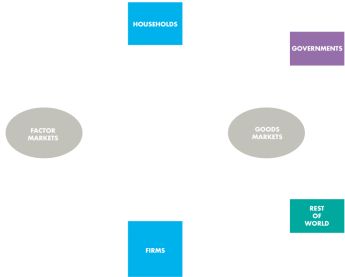
The equality of income and value of production shows the link between productivity and living standards.

The circular flow diagram in Fig. 20.1 illustrates the equality of income and expenditure.

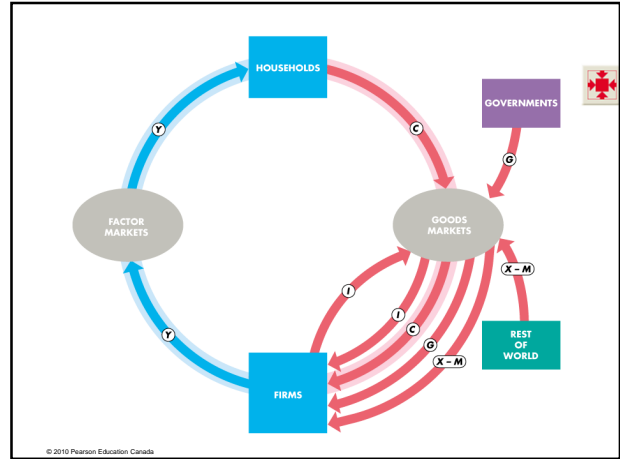
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Gross Domestic Product

The circular flow diagram shows the transactions among households, firms, governments, and the rest of the world.



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Gross Domestic Product

Households and Firms

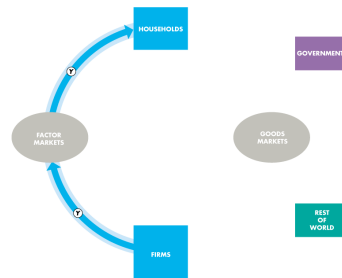
Households sell and firms buy the services of labour, capital, and land in **factor markets**.

For these factor services, firms pay income to households: wages for labour services, interest for the use of capital, and rent for the use of land. A fourth factor of production, entrepreneurship, receives profit.

In the figure, the blue flow, Y , shows total income paid by firms to households.

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Gross Domestic Product



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➤ Gross Domestic Product

Firms sell and households buy consumer goods and services in the **goods market**.

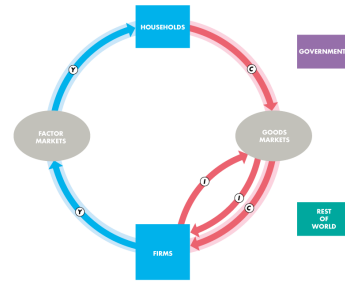
Consumption expenditure is the total payment for consumer goods and services, shown by the red flow labelled **C**.

Firms buy and sell new capital equipment in the goods market and put unsold output into inventory.

The purchase of new plant, equipment, and buildings and the additions to inventories are **investment**, shown by the red flow labelled **I**.

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Governments

Governments buy goods and services from firms and their expenditure on goods and services is called **government expenditure**.

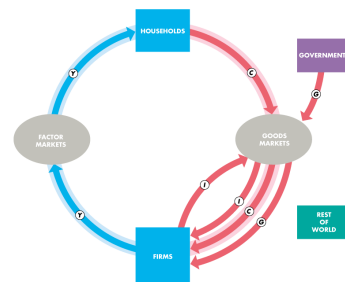
Government expenditure is shown as the red flow **G**.

Governments finance their expenditure with taxes and pay financial transfers to households.

These financial transfers are not part of the circular flow of expenditure and income.

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Gross Domestic Product

Rest of the World

Firms in Canada sell goods and services to the rest of the world—**exports**—and buy goods and services from the rest of the world—**imports**.

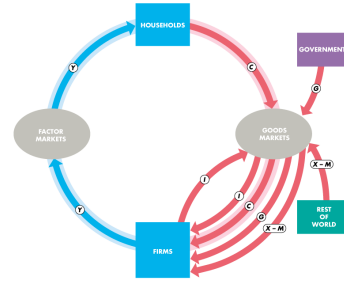
The value of exports (X) minus the value of imports (M) is called **net exports**, the red flow $X - M$.

If net exports are *positive*, the net flow of goods and services is from Canadian firms to the rest of the world.

If net exports are *negative*, the net flow of goods and services is from the rest of the world to Canadian firms.

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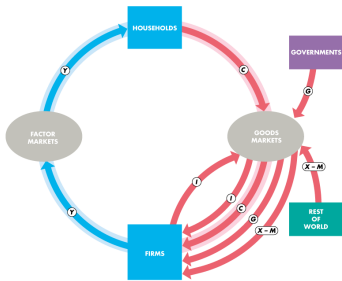
Gross Domestic Product



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Gross Domestic Product

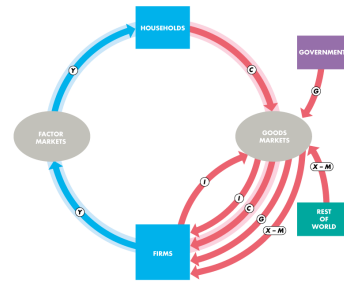
The blue and red flows are the circular flow of expenditure and income.



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Gross Domestic Product

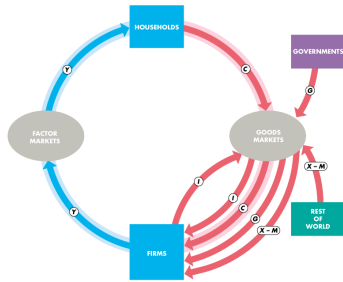
The sum of the red flows equals the blue flow.



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That is: $Y = C + I + G + X - M$



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➤ Gross Domestic Product

The circular flow shows two ways of measuring GDP.

GDP Equals Expenditure Equals Income

Total expenditure on final goods and services equals GDP.

$$GDP = C + I + G + X - M.$$

Aggregate income equals the total amount paid for the use of factors of production: wages, interest, rent, and profit.

Firms pay out all their receipts from the sale of final goods, so income equals expenditure,

$$Y = C + I + G + (X - M).$$

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Why Is Domestic Product Gross?

“Gross” means before deducting the depreciation of capital.

The opposite of *gross* is *net*.

“Net” means after deducting the depreciation of capital.

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Depreciation is the decrease in the value of a firm's capital that results from wear and tear and obsolescence.

Gross investment is the total amount spent on purchases of new capital and on replacing depreciated capital.

Net investment is the increase in the value of the firm's capital.

$$\text{Net investment} = \text{Gross investment} - \text{Depreciation}.$$

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Gross investment is one of the expenditures included in the expenditure approach to measuring GDP.

So total product is a gross measure.

Gross profit, which is a firm's profit before subtracting depreciation, is one of the incomes included in the income approach to measuring GDP.

So total product is a gross measure.

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➤ Measuring Canada's GDP

Statistics Canada uses two approaches to measure GDP:

- The expenditure approach
- The income approach

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➤ Measuring Canada's GDP

The Expenditure Approach

The *expenditure approach* measures GDP as the sum of consumption expenditure, investment, government expenditure on goods and services, and net exports.

$$GDP = C + I + G + (X - M)$$

Table 20.1 on next slide shows the expenditure approach with data (in billions) for 2008.

$$\begin{aligned} GDP &= \$885 + \$304 + \$357 + 32 \\ &= \$1,578 \text{ billion} \end{aligned}$$

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TABLE 20.1 GDP: The Expenditure Approach

| Item | Symbol | Amount in 2008 (billions of dollars) | Percentage of GDP |
|--|--------|--------------------------------------|-------------------|
| Personal expenditures on consumer goods and services | C | 885 | 56.1 |
| Business investment | I | 304 | 19.3 |
| Government expenditures on goods and services | G | 357 | 22.6 |
| Net exports of goods and services | X - M | 32 | 2.0 |
| Gross domestic product | Y | 1,578 | 100.0 |

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Measuring Canada's GDP

The Income Approach

The *income approach* measures GDP by summing the incomes that firms pay households for the factors of production they hire.

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Measuring Canada's GDP

The *National Income and Expenditure Accounts* divide incomes into five categories:

1. Wages, salaries, and supplementary labour income
2. Corporate profits
3. Interest and miscellaneous investment income
4. Farmers' income
5. Income from non-farm unincorporated businesses

These five income components sum to *net domestic income at factor cost*.

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Measuring Canada's GDP

Two adjustments must be made to get GDP:

1. Indirect taxes minus subsidies are added to get from *factor cost to market prices*.
2. Depreciation (or capital consumption) is added to get from *net domestic product to gross domestic product*.

Table 20.2 on the next slide shows the income approach with data for 2008.

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TABLE 20.2 GDP: The Income Approach

| Item | Amount in 2008 (billions of dollars) | Percentage of GDP |
|---|---|----------------------|
| Wages, salaries, and supplementary labour income | 815 | 51.6 |
| Corporate profits | 226 | 14.3 |
| Interest and miscellaneous investment income | 75 | 4.7 |
| Farmers' income | 1 | 0.1 |
| Income from non-farm unincorporated businesses | 92 | 5.9 |
| Net domestic income at factor cost | 1,210 | 76.6 |
| Indirect taxes less subsidies | 165 | 10.5 |
| Net domestic income at market prices | 1,375 | 87.1 |
| Depreciation | 202 | 12.8 |
| GDP (income approach) | 1,577 | 99.9 |
| Statistical discrepancy | 1 | 0.1 |
| GDP (expenditure approach) | 1,578 | 100.0 |

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Measuring Canada's GDP

Nominal GDP and Real GDP

Real GDP is the value of final goods and services produced in a given year when valued at *valued at the prices of a reference base year*.

Currently, the reference base year is 2000 and we describe real GDP as measured in 2000 dollars.

Nominal GDP is the value of goods and services produced during a given year valued at the prices that prevailed in that same year.

Nominal GDP is just a more precise name for GDP.

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Measuring Canada's GDP

Calculating Real GDP

Table 20.3(a) shows the quantities produced and the prices in 2002 (the base year).

Nominal GDP in 2000 is \$100 million.

Because 2002 is the base year, real GDP and nominal GDP both are \$100 million.

TABLE Calculating Nominal GDP and Real GDP

| Item | Quantity (millions) | Price (dollars) | Expenditure (billions of dollars) |
|--------------------------------|---------------------|-----------------|-----------------------------------|
| (a) In 2000 | | | |
| C T-shirts | 10 | 5 | 50 |
| J Computer chips | 3 | 10 | 30 |
| G Security services | 1 | 20 | 20 |
| Y Real and Nominal GDP in 2000 | | | 100 |

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Measuring Canada's GDP

Table 20.3(b) shows the quantities produced and the prices in 2009.

Nominal GDP in 2009 is \$300 million.

Nominal GDP in 2009 is three times its value in 2002.

TABLE Calculating Nominal GDP and Real GDP

| Item | Quantity (millions) | Price (dollars) | Expenditure (billions of dollars) |
|--------------------------------|---------------------|-----------------|-----------------------------------|
| (a) In 2000 | | | |
| C T-shirts | 10 | 5 | 50 |
| J Computer chips | 3 | 10 | 30 |
| G Security services | 1 | 20 | 20 |
| Y Real and Nominal GDP in 2000 | | | 100 |
| (b) In 2009 | | | |
| C T-shirts | 4 | 5 | 20 |
| J Computer chips | 2 | 20 | 40 |
| G Security services | 6 | 40 | 240 |
| Y Nominal GDP in 2009 | | | 300 |

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Measuring Canada's GDP

In Table 20.3(c), we calculate real GDP in 2009.

The quantities are those of 2009, as in part (b).

The prices are those in the base year (2002) as in part (a).

The expenditures sum to real GDP in 2009, which is \$160 million.

TABLE Calculating Nominal GDP and Real GDP

| Item | Quantity (millions) | Price (dollars) | Expenditure (billions of dollars) |
|---|---------------------|-----------------|-----------------------------------|
| (a) In 2000 | | | |
| C T-shirts | 10 | 5 | 50 |
| J Computer chips | 3 | 10 | 30 |
| G Security services | 1 | 20 | 20 |
| Y Real and Nominal GDP in 2000 | | | 100 |
| (b) In 2009 | | | |
| C T-shirts | 4 | 5 | 20 |
| J Computer chips | 2 | 20 | 40 |
| G Security services | 6 | 40 | 240 |
| Y Nominal GDP in 2009 | | | 300 |
| (c) Quantities of 2009 valued at prices of 2000 | | | |
| C T-shirts | 4 | 5 | 20 |
| J Computer chips | 2 | 10 | 20 |
| G Security services | 6 | 20 | 120 |
| Y Real GDP in 2009 | | | 160 |

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▶ The Uses and Limitations of Real GDP

Economists use estimates of real GDP for two main purposes:

- To compare the standard of living over time
- To compare the standard of living across countries

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The Standard of Living Over Time

Real GDP per person is real GDP divided by the population.

Real GDP per person tells us the value of goods and services that the average person can enjoy.

By using *real* GDP, we remove any influence that rising prices and a rising cost of living might have had on our comparison.

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Long-Term Trend

A handy way of comparing real GDP per person over time is to express it as a ratio of some reference year.

For example, in 1971, real GDP per person was \$20,127, and in 2007, it was \$40,070.

So real GDP per person in 2007 was approximately double its 1971 level.

Measured by real GDP per person, people were twice as well off in 2007 as people had been in 1971.

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Two features of our expanding living standard are

- The growth of potential GDP per person
- Fluctuations of real GDP around potential GDP

The value of real GDP when all the economy's labour, capital, land, and entrepreneurial ability are fully employed is called **potential GDP**.

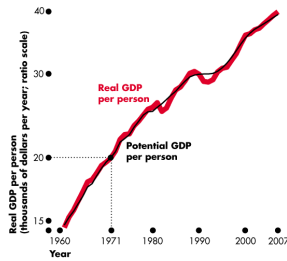
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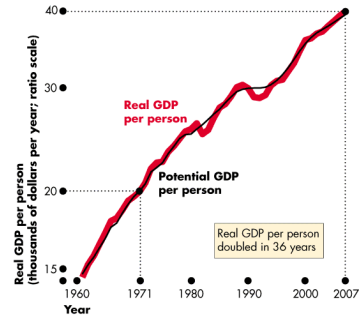
Figure 20.2 shows real GDP per person in Canada.

Potential GDP grows at a steady pace because the quantities of the factors of production and their productivity grow at a steady pace.

Real GDP fluctuates around potential GDP.



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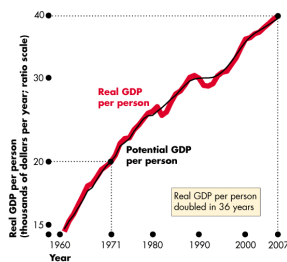


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Real GDP per person in the Canada:

Doubled in 36 years.



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Productivity Growth Slowdown

The growth rate of real GDP per person slowed after 1970. How costly was that slowdown?

The answer is provided by a number that we'll call the Lucas wedge.

Lucas wedge is the dollar value of the accumulated gap between what real GDP per person would have been if the 1960s growth rate had persisted and what real GDP per person turned out to be.

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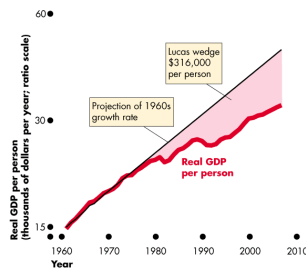
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Figure 20.3 illustrates the Lucas wedge.

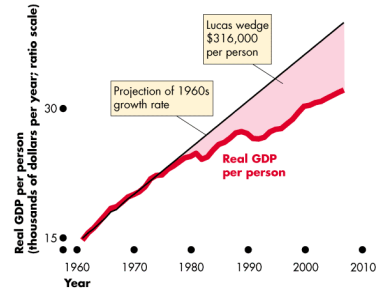
The red line is actual real GDP per person.

The thin black line is the trend that real GDP per person would have followed if the 1960s growth rate of potential GDP had persisted.

The shaded area is the Lucas wedge.



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Real GDP Fluctuations

A **business cycle** is a periodic but irregular up-and-down movement of total production and other measures of economic activity.

Every cycle has two phases:

1. Expansion
2. Recession

and two turning points:

1. Peak
2. Trough

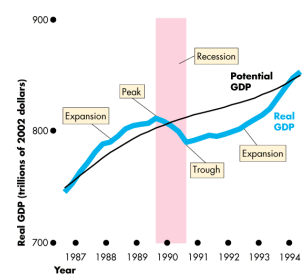
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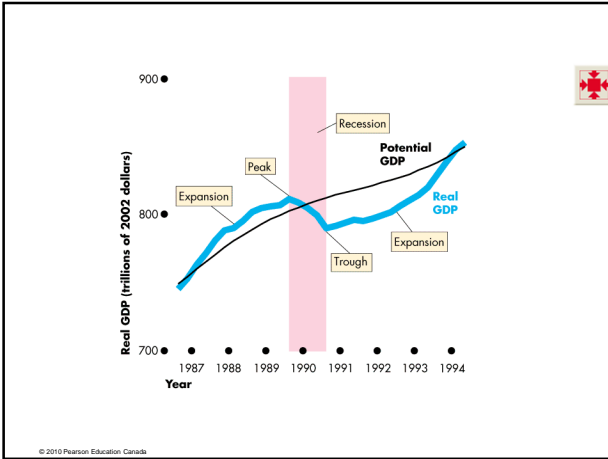
Figure 20.4 illustrates the business cycle.

An **expansion** is a period during which real GDP increases.

Recession is a period during which real GDP decreases—its growth rate is negative—for at least two successive quarters.



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Standard of Living Across Countries

Two problems arise in using real GDP to compare living standards across countries:

1. The real GDP of one country must be converted into the same currency units as the real GDP of the other country.
2. The goods and services in both countries must be valued at the same prices.

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Using the exchange rate to compare GDP in one country with GDP in another country is problematic because ...

prices of particular products in one country may be much less or much more than in the other country.

For example, using the market exchange rate to value Chinese GDP in U.S. dollars leads to an estimate that in 2008, U.S. real GDP per person was 19 times Chinese real GDP per person.

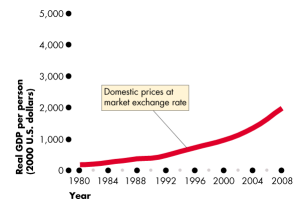
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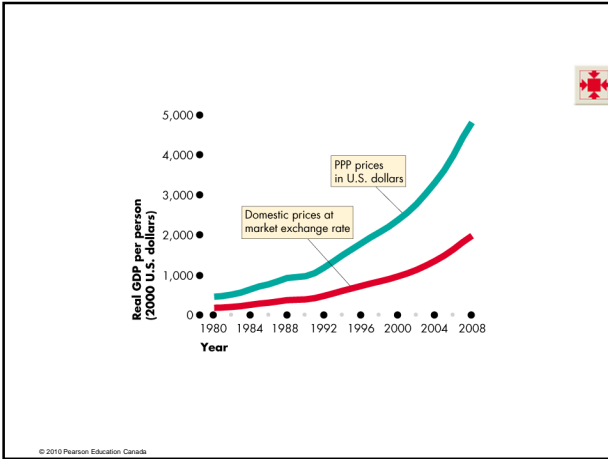
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Figure 20.5 illustrates the problem.

Using the market exchange rate and domestic prices leads to an estimate that China is very poor.

Real GDP per person in China is 5 percent of U.S. real GDP per person.





◆ The Uses and Limitations of Real GDP

Using purchasing power parity prices

China's real GDP per person is 12.5 percent of U.S. real GDP per person.

| Year | Domestic prices at market exchange rate | PPP prices in U.S. dollars |
|------|---|----------------------------|
| 1980 | ~500 | ~1,000 |
| 1984 | ~600 | ~1,200 |
| 1988 | ~800 | ~1,500 |
| 1992 | ~1,000 | ~1,800 |
| 1996 | ~1,200 | ~2,200 |
| 2000 | ~1,500 | ~2,800 |
| 2004 | ~1,800 | ~3,800 |
| 2008 | ~2,200 | ~4,800 |

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◆ The Uses and Limitations of Real GDP

Limitations of Real GDP

Real GDP measures the value of goods and services that are bought in markets.

Factors not in GDP that influence the standard of living are

- Household production
- Underground economic activity
- Health and life expectancy
- Leisure time
- Environmental quality
- Political freedom and social justice

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